October 23, 1996

Mr. Mark Ader
United States Environmental Protection Agency
1200 Sixth Avenue, ECL-115
Seattle, WA 98101

Re: Contract No. 68-W6-0008, Technical Direction Document No. 96-07-0013
Former NIKE Launch site #81 Preliminary Assessment

Dear Mr. Ader:

Enclosed please find the draft Preliminary Assessment (PA) report completed for the Former NIKE Launch site #81 located in Poulsbo, Washington. Results of the PA indicate that the groundwater pathway has the greatest potential to impact receptors.

This Technical Direction Document will remain open to address comments to this report. If you have any questions regarding this PA, please call me at 206/624-9537.

Sincerely,

ECOLOGY AND ENVIRONMENT, INC.

Jeffrey Fowlow
Project Leader

cc: Gary Sink, EPA, Region 10 (letter only)
William Carberry, E & E, Seattle (letter only)

DRAFT PRELIMINARY ASSESSMENT
FORMER NIKE LAUNCH SITE #81
POULSBO, WASHINGTON

TDD: 96-07-0013

Contract No: 68-W6-0008

October 22, 1996

REGION X

START

SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM

Prepared for:

EPA

Office of Environmental Cleanup
Region X

MARK ADER
TASK MONITOR

Prepared by:

ecology and environment, inc.
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PROJECT MANAGER

DRAFT
PRELIMINARY ASSESSMENT
FORMER NIKE LAUNCH SITE #81
POULSBO, WASHINGTON

START REGION X

Contract No. 68-W6-0008
Technical Direction Document No. 96-07-0013

October 1996

Prepared By:

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1500 First Interstate Center
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DRAFT
PRELIMINARY ASSESSMENT
FORMER NIKE LAUNCH SITE #81
POULSBO, WASHINGTON

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

1.0 INTRODUCTION

Ecology and Environment, Inc., (E & E) has been tasked by the U.S. Environmental Protection Agency (EPA) to provide technical support for completion of a Preliminary Assessment (PA) at the Former NIKE Launch site #81 in Poulsbo, Washington. E & E completed PA activities under Technical Direction Document No. 96-07-0013, issued under EPA Region X Superfund Technical Assessment and Response Team (START) Contract Number 68-W6-0008. The specific goals for this PA identified by EPA are presented below:

- Determine the potential threat to public health or the environment posed by the site;
- Determine the potential for a release of hazardous constituents into the environment; and
- Determine the potential for placement of the site on the National Priorities List.

Completion of the PA included reviewing existing site information, collecting receptor information within the range of site influence, determining regional characteristics, and conducting a site visit. This document includes a discussion of background site information (Section 2); a discussion of migration/exposure pathways and potential receptors (targets) (Section 3); and a list of pertinent references (Section 4).

2.0 SITE BACKGROUND

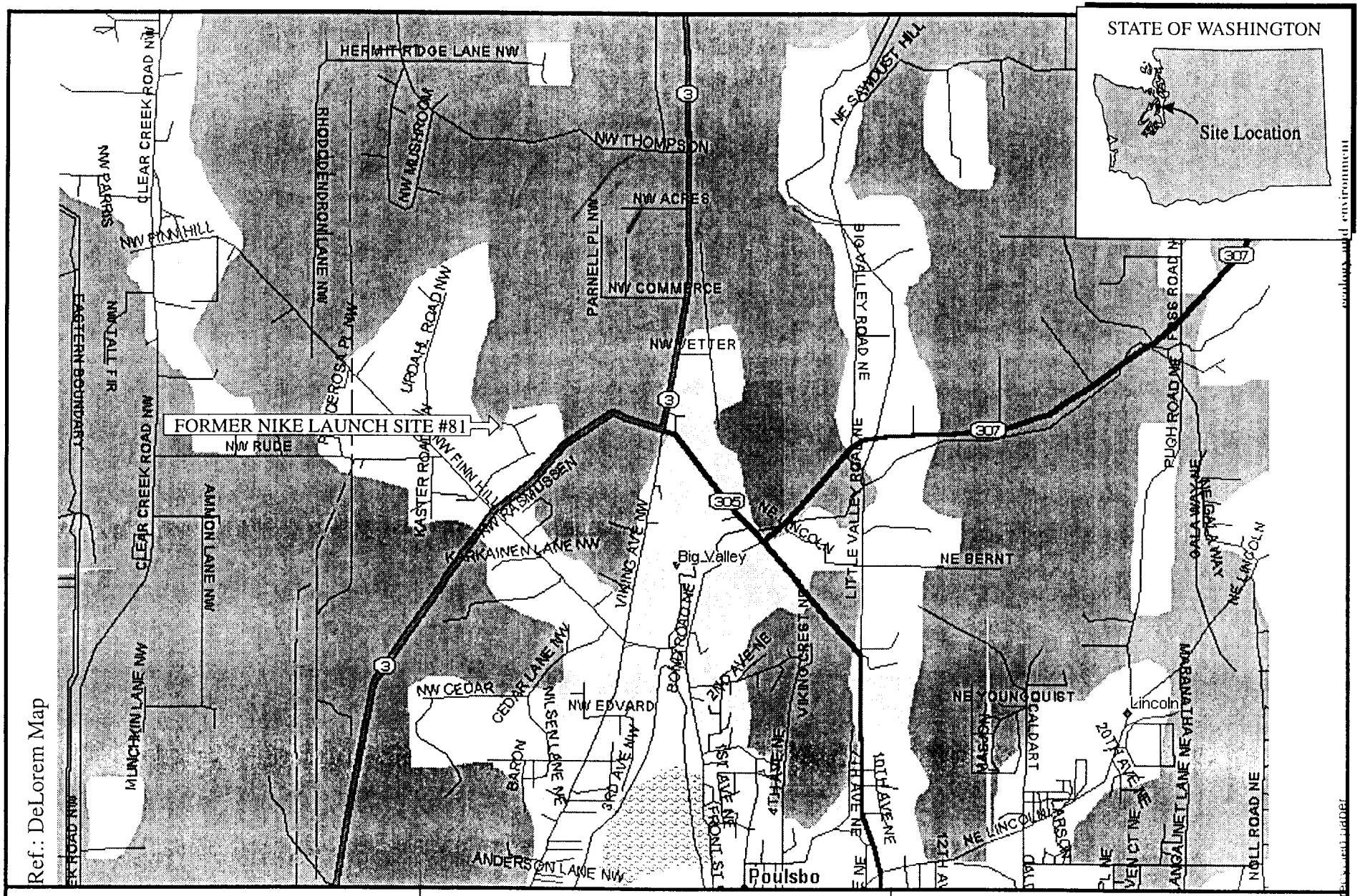
2.1 SITE LOCATION

Site Name:	Former NIKE Launch site #81
CERCLIS ID No.:	WA0001414184
Location:	Finn Hill Road Poulsbo, Washington 98370
Latitude:	47° 45' 27" North
Longitude:	122° 39' 43" West
Legal Description:	Section 10, Township 26 North, Range 1 East
Site Owners:	(b) (6) c/o First Western Investments 100 Second Avenue South, Suite 250 P.O. Box 1449 Edmonds, Washington 98020-1449 (206) 775-6000
Site Contacts:	Mark Zenger First Western Investments 100 Second Avenue South, Suite 250 P.O. Box 1449 Edmonds, Washington 98020-1449 (206) 775-6000

2.2 SITE DESCRIPTION

The Former NIKE Launch site #81 is an inactive U.S. Army NIKE Ajax missile launch facility located approximately 1.5 miles northwest of Poulsbo, Washington city limits on the north side of Finn Hill Road (Figure 2-1). The site originally consisted of 81.91 acres of level and sloping ground containing three missile launch silos, a generator building, a missile assembly building, a missile fueling station (acid fueling station), a maintenance shop (consisting of two sheds), a barrack, and a well house (Figure 2-2). The site is fenced with a gated entrance off Finn Hill Road.

The site was constructed by the U.S. Army on land obtained via acquisitions in fee, easements, and licenses made between 1955 and 1959 (USAED 1985). Disposal of the property



Ref.: DeLorem Map

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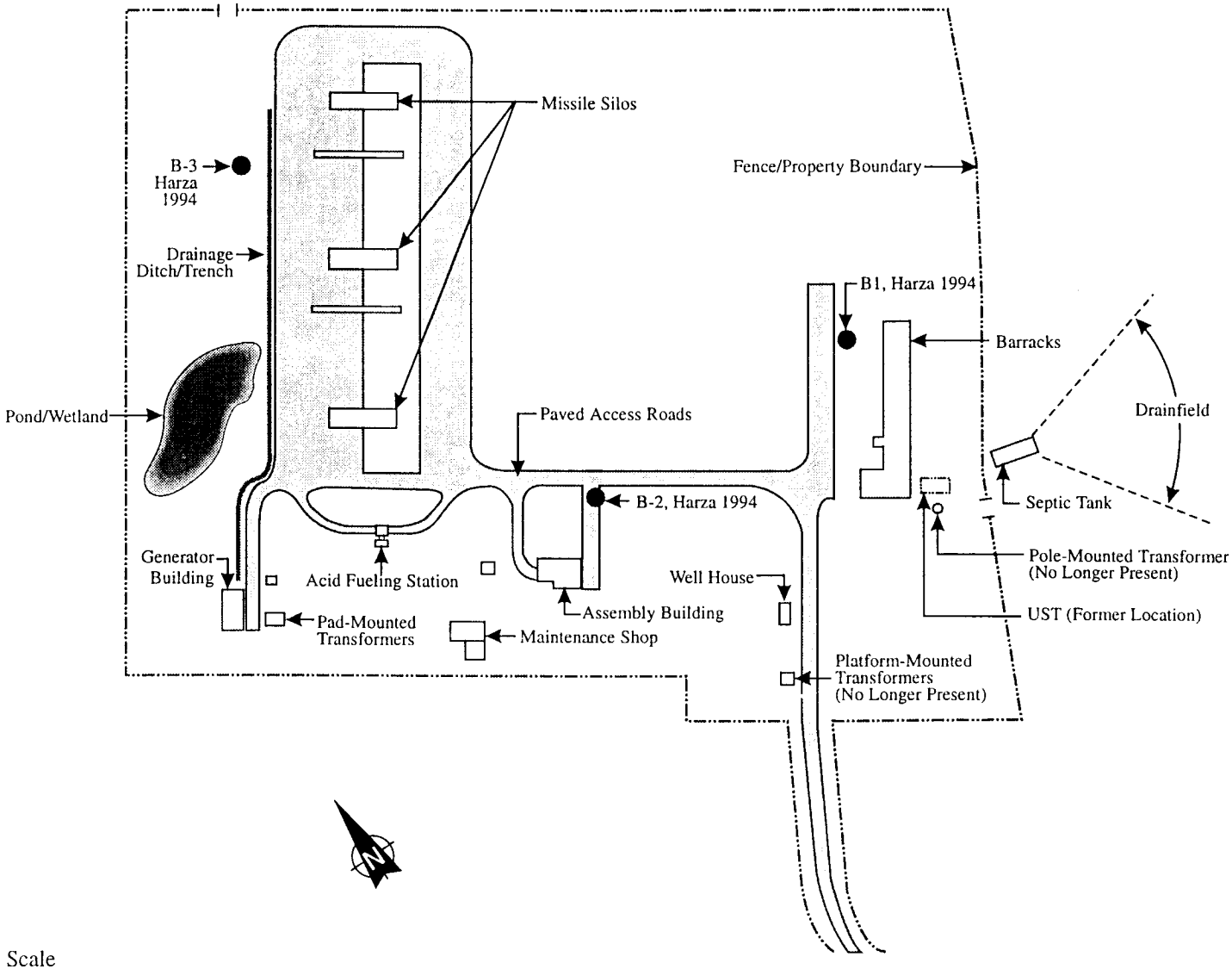
FORMER NIKE LAUNCH SITE #81

SCALE: 1 INCH = 1/2 MILE (APPROX)

FIGURE 2-1
SITE LOCATION MAP

Drawn By:	Date	TDD/Job No.	Dwg. No.
MRE	10-11-96	AG1301SADO	AG1301F1



Drawing Not to Scale

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Seattle, Washington

FORMER NIKE MISSILE
LAUNCH SITE #81
Poulsbo, Washington

Figure 2-2
SITE LAYOUT
NIKE MISSILE BASE

Drawn By:	Date	TDD/Job No.	Dwg. No.
MRE	10-16-96	AG1301	AG1301F5

occurred between 1966 and 1980 by various means with 35.37 acres containing facility structures fee conveyed by the U.S. General Services Administration to (b) (6) in February 1967 (USAED 1985) (b) (6) used the property for 2 to 3 years for horse and cattle pasturage, and made an addition to the assembly building which he rented out for approximately 1-1/2 years. First Western Investments (FWI) currently represents (b) (6), who retains ownership of the site. The property is bordered on the north, northeast, west, and southwest primarily with undeveloped and residential land. The site is bordered on the southeast by State Route 3.

2.3 SITE OPERATIONS AND WASTE CHARACTERISTICS

Insufficient documented information exists regarding site-specific operations and waste characteristics for the period that the site was an active NIKE Ajax missile launch facility. However, a report prepared by Law Environmental Services (LES) for the U.S. Army Corps of Engineers titled "*The NIKE Missile Site Investigation Program*" is available which describes general activities at NIKE Ajax missile sites across the nation. Information contained in this report will be used to supplement the site history.

An aerial photograph review of the site conducted by a contractor for FWI in 1992 reported the presence of several buildings and roads in 1956 (ERM 1992). It is assumed that operations at the site began in this year. NIKE Ajax missiles were deployed by the U.S. Army throughout the continental United States to protect major metropolitan areas and strategic military installations from aerial attack (LES, not dated).

Missiles and warheads were assembled, maintained, prepared for firing, and stored at the Launcher area of a NIKE site with each of these activities being conducted at a separate building or location at the site. Missiles were fueled at outdoor fueling stations with acidic liquid fuels including inhibited red fuming nitric acid (IRFNA), unsymmetrical dimethyl hydrazine (UDMH), anilinefurfuryl alcohol, and ethylene oxide, which are highly toxic. Battery electrolyte, potentially containing lead, reportedly was discarded at fueling stations on NIKE sites (LES, not dated). Missile assembly operations involved the use of various solvents, anticorrosion products, and paints (LES, not dated). Assembly buildings were equipped with a full-length waste fluid collection system and associated underground drainfield (LES, not dated). The presence of such a drainage system at the Former NIKE Launch Site #81 has not been confirmed. However, records of the "sale of site property" list a waste sewer system containing 250 lineal feet of drain line for acid as a line item asset (McLeod 1967). The location of this system is not provided and, if present at the Nike site, it is speculated that the system may be associated with either the assembly building or with the acid fueling station. Maintenance of the missile batteries in a combat ready status required the storage, handling, and disposal of missile components, as well as solvents, fuels, hydraulic fluids, paints, and other materials required for support functions (LES, not dated).

Three collocated subterranean missile launch silos are present at the Former NIKE Launch site #81. The silos extend to approximately 25 feet below ground surface (bgs) and contain elevators for access. One missile magazine is associated with each silo. Typically NIKE magazines contained a floor drainage system which permitted waste materials to be washed to a central sump located under the silo elevator shaft (LES, not dated). As a general practice at NIKE sites, solvents, paints, and hydraulic fluid were reported washed to the sumps (LES, not dated). Waste water that collected in the sumps at the Former NIKE Launch site #81 were pumped to a surficial drainage ditch running the northwestern length of the silo area.

A septic system consisting of a 12,000 gallon septic tank and drainfield with 1,110 lineal feet of sewer line is present at the barracks (McLeod 1967). Battery electrolyte and other hazardous materials may have been disposed to the septic system during the facility deactivation process (LES, not dated).

At one time, seven transformers were located on site, including: three platform-mounted transformers near the site access road, three pad-mounted transformers near the generator building, and one pole-mounted transformer near the barracks. The three platform-mounted and the pole-mounted transformers were found to contain PCBs in excess of 50 ppm and have been removed from the site (ERM 1992) (see discussion Section 2.4).

Also, four underground storage tanks (USTs) used to contain fuel oil once existed at the site: one at the assembly building, two at the generator building, and one at the barracks (WSI 1993). A discussion of tank removal activities is provided in Section 2.4.

2.4 SITE INVESTIGATIONS

In August 1985, the U.S. Army Engineer District, Seattle, conducted a survey of the site under the Defense Environmental Restoration Program (DERP). This survey determined that the site was essentially as the Army had left it in 1967 and that all NIKE-era structures on the property had been used by (b) (6) for various purposes. The survey concluded that because all site facilities had been used by the current property owner, and because the property owner did not express an interest in having remedial work done under DERP, no further action was required (USAED 1985).

In August 1992, a consultant to the U.S. Army Corps of Engineers, Seattle District (USACE) provided permanent closure services for the four USTs previously used to store fuel. Two 2,000-gallon USTs (81L-2 and 81L-3) were associated with the generator building, one 500-gallon UST (81L-4) was associated with the assembly building, and one 2,000-gallon UST (81L-5) was associated with the barracks. Soil samples were collected adjacent to the USTs and submitted for gasoline-, diesel-, and oil-range petroleum hydrocarbons; benzene, toluene, ethyl benzene, and xylenes; and lead analysis. Analytical results revealed fuel-related soil contamination at both USTs near the generator building and also at the UST near the barracks. Fifteen cubic yards of contaminated soil was removed from around one UST (81L-2) at the

generator building. No other contaminated soils were removed. All USTs were excavated, emptied of contents, cleaned, and the contents and USTs disposed off site. Excavated soils were stockpiled at the site (WSI 1993).

In September 1992, a consultant for FWI completed a Phase I and II environmental site assessment of the Former NIKE Launch site #81. During this investigation, samples were collected from on-site structures of materials suspected of containing asbestos. Analytical results indicated the presence of asbestos in the hard fittings on the piping system in the bathroom of the assembly building, in all rooms of the barracks, in insulation on a large tank in the boiler room of the barracks, and in the vinyl floor tile and associated mastic in the barracks (ERM 1992). Further, insulation of power cables in the floor of the generator building, possibly containing asbestos, was not sampled because the power to these cables may still have been connected (ERM 1992). Also, although not sampled due to access limitations, asbestos was suspected to be present in the entry door to each missile silo, as well as in the wall spacers inside the 2 x 4 foot frame walls of the generator building (ERM 1992). All aboveground asbestos-containing material has reportedly been abated (E & E 1996).

As a part of the Phase I and II investigation, soil samples of areas suspected of containing hazardous substances were collected. Soil samples submitted for analyses included one three-part composite sample of soils in the drainage ditch adjacent to the silos collected from 0 to 12 inches bgs (SP-1), one composite sample each of soils adjacent to the north (MS-1) and east (MS-2) sides of the northern maintenance shed, and one sample (ST-1) from beneath a drainage pipe associated with the barracks septic system. All four samples were submitted for volatile organics analyses (EPA Method 8240). Samples SP-1, MS-1, and ST-1 were submitted for hydrocarbon identification and quantification (WDOE Method HCID-WTPH), and samples SP-1 and ST-1 also were submitted for chromium and total lead analyses (ERM 1992). Analytical results are as indicated in Table 2-1.

Table 2-1
Former NIKE Launch site #81
SOIL SAMPLE RESULTS

Sample Number	Location	Analyte	Concentration
SP-1	Silo Drainage Ditch	WTPH-HCID: Diesel TPH-D VOCs Chromium Lead	Present 290 ppm ND 17 ppm 18 ppm
MS-1	Maintenance Shed (north side)	WTPH-HCID VOCs	ND ND
MS-2	Maintenance Shed (east side)	VOCs: 2-butanone	0.52 ppm
ST-1	Septic Drainfield	WTPH-HCID VOCs Chromium Lead	ND ND 21 ppm ND

Key:
ND — Not detected
ppm — Parts per million
TPH-D — Total Petroleum Hydrocarbons-Diesel
WTPH-HCID — Washington Hydrocarbon Identification and Quantitation
VOCs — Volatile Organic Compounds

Source: ERM 1992

In September 1995, the three pad-mounted and the three platform-mounted transformers were sampled and analyzed for halogenated organic compounds (HOC) (EPA Method 9076 - modified) and PCBs (EPA Method 8080). In October 1995, the pole-mounted transformer also was sampled and analyzed for HOC (Method ASTM D-808) and PCBs (EPA Method 600/4-81-045). Analytical results indicated that the three platform-mounted and the pole-mounted transformers contained PCBs above 50 ppm up to 157 ppm and that the three pad-mounted transformers contained less than 1 ppm PCBs. HOC concentrations for the platform-mounted transformer ranged from 126 to 206 ppm, the pole-mounted transformer contained 480 ppm HOC, and the three pad-mounted transformers contained less than 100 ppm HOC. In February 1996, the four PCB transformers were manifested off site for disposal (Reynolds 1996).

In September 1995, the USACE excavated four test pits in or adjacent to the former location of UST 81L-2 at the generator building (USACE 1995). At least one soil sample was collected from each pit for fixed laboratory analyses of gasoline-, diesel-, and oil-range petroleum hydrocarbons; benzene, toluene, ethyl benzene, and xylene; and total lead (USACE 1995). Analytical results for this work are not yet available (Bilodeau 1996). Reportedly, the fifteen cubic yards of soil previously excavated from this location were transported to an off-site disposal facility in conjunction with this sampling effort (Bilodeau 1996). No additional work was conducted for contaminated soils adjacent to 81L-3 or 81L-5 because one UST was

determined not to require further investigation under State of Washington UST regulations and the other UST location could not be identified (Bilodeau 1996). A draft request for partial closure of USTs at the site was submitted by the USACE to the Washington State Department of Ecology on September 27, 1996 in an Independent Remedial Action report (Bilodeau 1996).

In November 1995, a consultant for FWI collected one water sample from each of the three silos. Approximately 17 feet of water was present in each silo with each silo estimated to contain 240,070 gallons of water. The samples were composites consisting 50% of water taken from the surface and 50% of water taken from the bottom of the water column. The samples were analyzed for total petroleum hydrocarbons (EPA Method 418.1), volatile organics (EPA Method 624), polychlorinated biphenyls (EPA Method 8080), and priority pollutant metals (EPA Method 6010, except for mercury which was by cold vapor extraction). Analytical results are summarized in Table 2-2.

Table 2-2
Former NIKE Launch site #81
SILO WATER SAMPLE RESULTS

Analyte	Silo A Concentration (ug/L)	Silo B Concentration (ug/L)	Silo C Concentration (ug/L)
TPH	<0.2	<0.2	<0.2
VOCs	ND	ND	ND
PCBs	0.8	0.8	0.9
Total Metals			
Lead	7	6	7
Copper	3	7	3
Zinc	1,400	1,400	1,100
Dissolved Metals			
Lead	19	7	8
Copper	3	2	2
Zinc	1,200	1,400	1,000

Key:
ND Not detected
PCBs Polychlorinated biphenyls
TPH Total petroleum hydrocarbons
ug/L Micrograms per liter
VOCs Volatile Organic Compounds

Source: Becker, 1996

In September 1996, water in the silos was pumped out by this consultant to an irrigation line laid out in the field north of the drainage ditch.

In April 1996, lead-based paint in the bathroom of the officers quarters (in the barracks) and in the bathroom of the assembly building was removed and placed in 55-gallon drums by a consultant to FWI.

On October 8, 1996, the START met (b) (6), a member of the (b) (6) family, and Kent Berryman, a planning consultant to FWI, near the site. A walk-through of all on-site structures was conducted with the exception of the missile silos because the elevators to the silos have not been operational since the transformers were removed. The assembly building (Figure 2-3) contained seven 55-gallon drums marked "Danger/Lead" that were generated during the lead-based paint abatement in April 1996. Two of the drums reportedly are empty. The drums are stored in a room that contains a pile of debris and three of the drums are resting on this pile. Most of the floor space of this building is covered with debris largely consisting of inert materials such as wood, doors, old mattresses, pipes, and an abandoned refrigerator. No drainage trenches, drain pipes, or sumps were observed that might indicate the presence of a drainage system which is generally associated with NIKE assembly buildings. A small building was located northwest of the assembly building. This building contained two open bags of concrete and one 55-gallon fiber drum labeled "Meadow Gold". The drum felt empty when pushed. The maintenance shop (Figure 2-2) consists of two contiguous sheds. The smaller shed contained very little debris. The larger shed was full of debris consisting of remnants of cable wire on spools, wood, workbenches, empty 5-gallon buckets, tires, and metal tubing among other items. Much of the concrete floor of the larger shed was stained with what appeared to be motor oil.

The acid fueling area (Figure 2-2) contains a concrete pad, approximately 10 by 15 feet; a concrete structure that appears to be a hexagonal vault or tank; and a second concrete pad, approximately 4 by 7 feet. These structures are contiguous and a water pipe with a shower head and a vent pipe extend from the second concrete pad (which is believed to be the foundation for a acid fueling station). The area is heavily vegetated and no outward signs of a drainfield is present (i.e., sumps or drains).

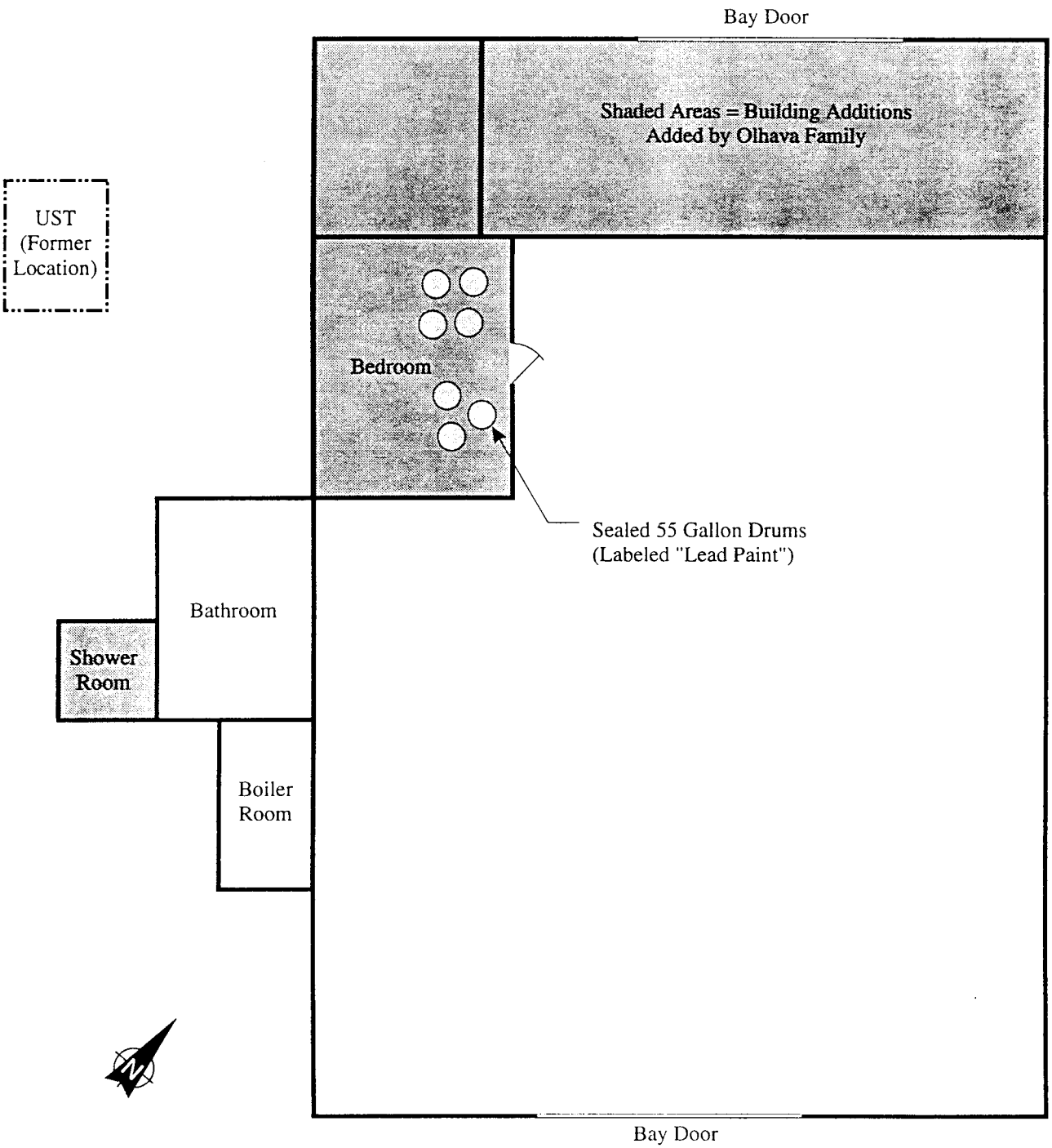
The generator building (Figure 2-4) contains an aboveground storage tank previously used by the Army to store diesel fuel and later used by (b) (6) to store gasoline. Two series of trenches run the length of the concrete foundation of the building. The northernmost trenches were used to convey piping from the AST to the generators. The southernmost trenches were used for electrical conduit. No drains or sumps were observed in these trenches or in the building foundation. A vent pipe extends from the ground on the northwest corner of the building. The pipe is connected to the AST and at one time also was connected to the former UST that was located in this area. A fenced enclosure containing the three pad-mounted transformers (non-PCB transformers) is located southeast of the generator building. The concrete under the transformers appeared to be stained with oil.

Although the missile silos were not entered, the concrete roofs of the silos, which are at the ground surface, were observed. The silo roofs contain several pipe, wiring, and ventilation vaults. A large, backfilled excavation is present north of each silo. The excavations extend across the silo perimeter road north to the drainage ditch. Nearly the entire length of the drainage ditch also has been excavated and

backfilled as has a trench along the northern side of the road to the generator building. The excavations were conducted to remove suspected asbestos containing electrical conduit leading from the generator building to the missile silos (E & E 1996).

The barracks septic system is located southeast of site's property boundary on land sold by (b) (b) (6) to the State of Washington in the 1970s. A locked gate is present in the site's perimeter fence at this location.

The well house contains a water tank with an approximate capacity of 1,000 gallons and the water well. The well pump has been disconnected, however, it is still in place.



Drawing Not to Scale

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	Title: FORMER NIKE MISSILE LAUNCH SITE #81 Poulsbo, Washington	Figure 2-3 ASSEMBLY BUILDING NIKE MISSILE BASE

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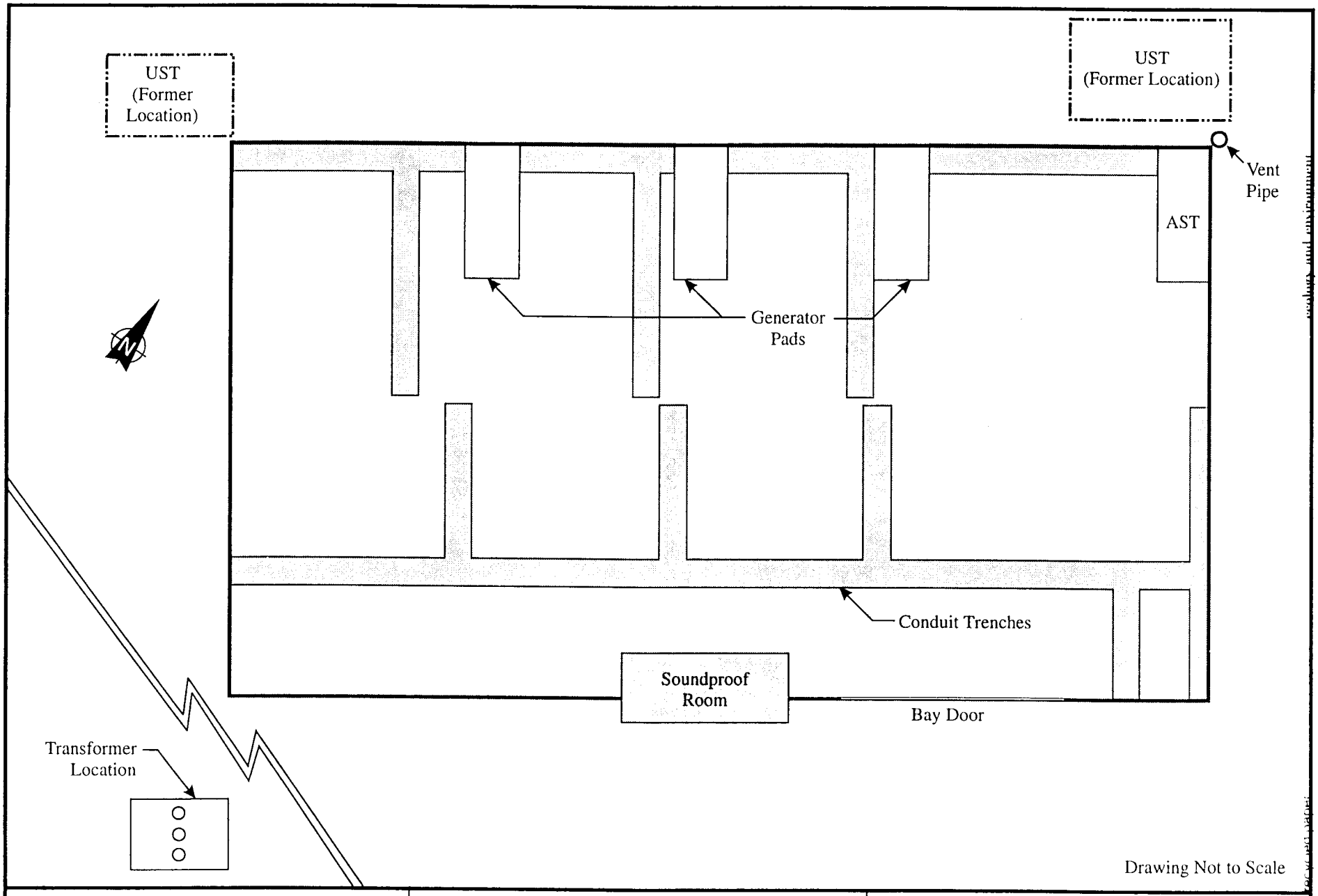
MRE	10-16-96	AG1301	AG1301F4



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FORMER NIKE MISSILE
LAUNCH SITE #81
Poulsbo, Washington

Figure 2-4
GENERATOR BUILDING
NIKE MISSILE BASE

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MRE	10-15-96	AG1301	AG1301F6

3.0 MIGRATION/EXPOSURE PATHWAYS AND TARGETS

The following sections describe migration/exposure pathways and potential targets within the site's range of influence (Figure 3-1 and Figure 3-2).

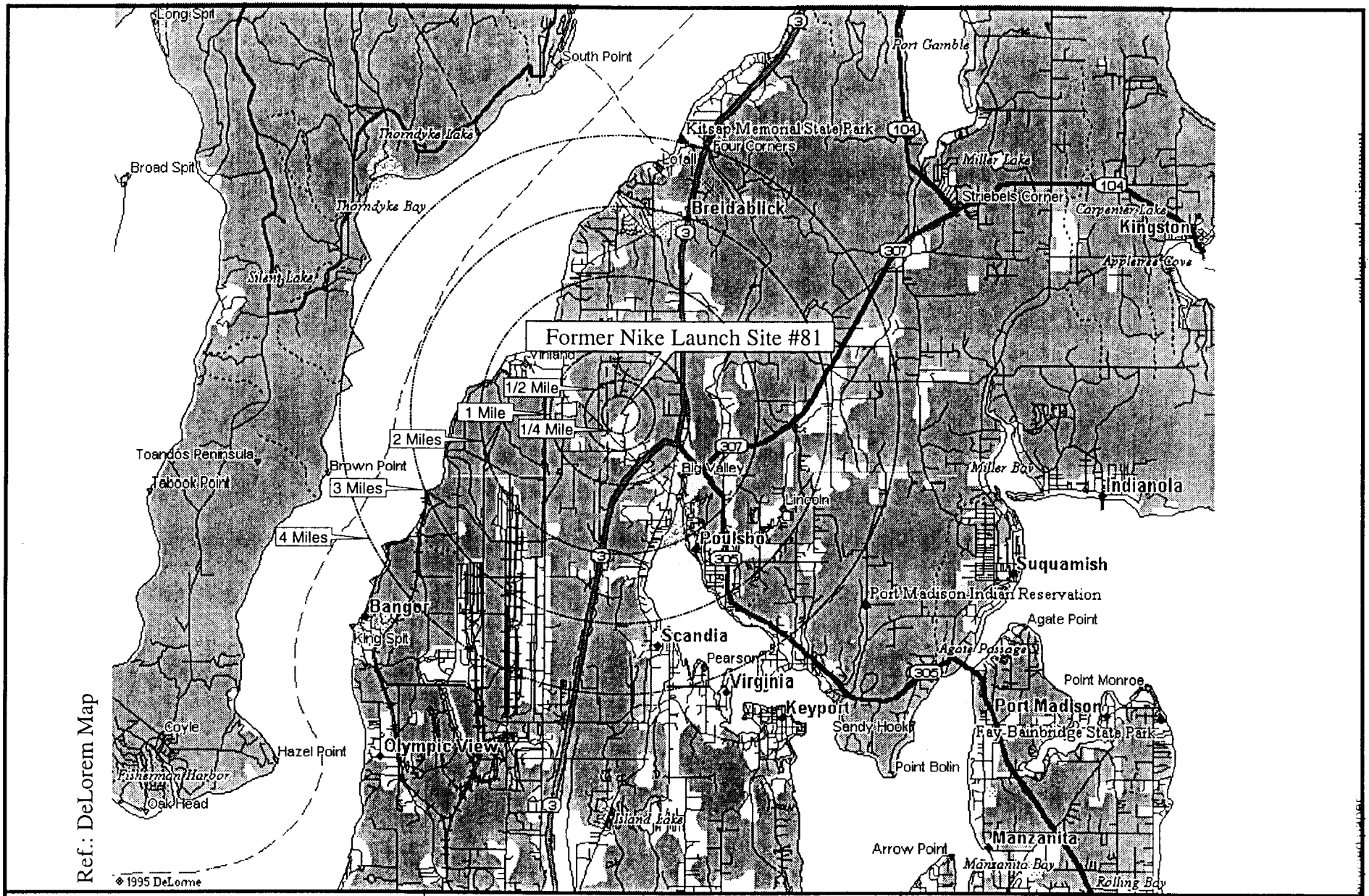
3.1 GROUNDWATER MIGRATION PATHWAY

The site is underlain by approximately 80 feet of glacial till deposited during the Vashon period (ERM 1992). Vashon till is typically impervious to groundwater flow except through thin, often discontinuous, sand and gravel stringers. The Vashon till will cause precipitation to perch at or near the ground surface and may hold such waters in shallow depressions allowing the formations of wetlands (ERM 1992).

The Vashon till is underlain by the Puyallup Formation which consists of sand and gravel with some clay interbeds. The Admiralty Formation, which underlies the Puyallup Formation, is a regional clay formation of varying thicknesses with low permeability (ERM 1992).

Well logs of test borings in the area indicate that perched water occurs on the surface of the glacial till, at an average depth of 2.5 feet bgs (ERM 1992). A boring log of the on-site water supply well (unpublished data) indicates that the first groundwater aquifer occurs at a depth of approximately 103 feet bgs. Static water level in the well was recorded at a depth of 93 feet bgs. The well was completed in a well-graded sand formation suggesting that it taps the Puyallup Formation (ERM 1992). This well was taken out-of-service when transformers supplying power to the well were removed (E & E 1996).

In 1994, subsurface exploration was performed at and adjacent to the Nike site by Harza Northwest, Inc. A truck-mounted drill rig was used to drill eight widely-spaced boreholes (Harza 1994). Three of the boreholes (B-1, B-2, B-3) were drilled within or bordering the former Nike site (Figure 2.2). Groundwater was encountered in two of these borings at depths of 9 and 20 feet bgs. The groundwater encountered as possibly perched. According to borehole logs, the upper 1.5 to 5 feet of surface soils consist of loose to dense silty sand. In boring B-1, very dense olive grey sand was encountered under the upper horizon at 5 feet bgs. In borings B-2 and B-3, the upper horizon was underlain by interbedded mottled silty sand, clayey sand, sand, and silty clay/clayey silt (Harza 1994). The lower horizon ranged in thickness from 2.5 to 3 feet thick. Boring B-2 contained very dense olive grey sand from 8 feet bgs to the bottom of the hole at 20.5 feet bgs.



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FORMER NIKE LAUNCH SITE #81

FIGURE 3-1
SITE RANGE OF INFLUENCE

SCALE: 1/2 INCH = 1 MILE

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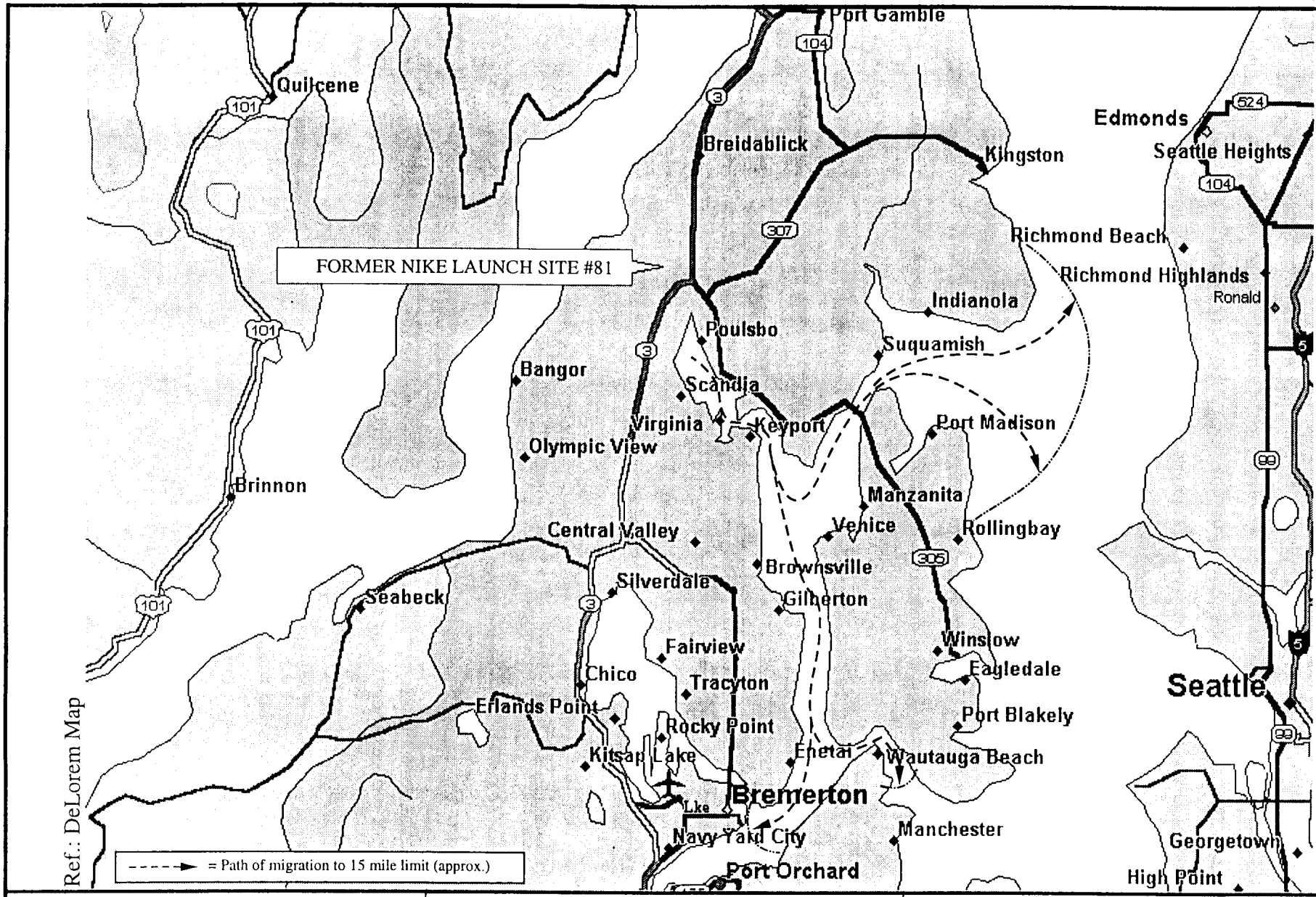

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FORMER NIKE LAUNCH SITE #81

FIGURE 3-2
SITE 15 MILE RANGE OF INFLUENCE

SCALE: 1" = 3.3 MILES (APPROX.)

Drawn By:	Date	TDD/Job No.	Dwg. No.
MRE	10-11-96	AG1301SADO	AG1301F3

Boring B-3 contained very dense olive grey silty sand from 5.5 feet bgs to the bottom of the hole at 20.5 feet bgs. A significant percentage of gravel and cobbles was encountered in all borings throughout the drilled intervals (Harza 1994).

Seventeen municipal water systems are present within 4 miles of the site (EPA 1996). The majority of these systems (11 total) consist of one well serving a small community of less than 300 people. Four of the multiple well water systems have all their wells in the same distance ring. The two remaining water systems with multiple wells (i.e., the City of Poulsbo and Naval Sub Base Bangor) have wells in more than one distance ring. The City of Poulsbo operates five wells serving approximately 2,745 people: three active, one standby, and one inactive (Strickland 1996). The Bangor Naval Sub Base operates six active wells serving a total population of 15,600 people (Pittman 1996). Water for these systems is blended and no one well contributes more than 40 percent to the water system (Strickland 1996, Pittman 1996). For this reason, the population served by each well was apportioned by dividing the total population served by the number of wells in each system as follows:

- City of Poulsbo: total population 2,745 / 4 wells = 686.25 people per well; and
- Naval Sub Base Bangor: total population 15,600 / 6 wells = 2,600 people per well.

A search of State of Washington water well reports maintained in Belleuve, Washington revealed only one well log within 4 miles of the site, a private drinking water well located approximately 1 - 2 miles from the site (Petrovich 1996). Although not on record, it is expected that additional private wells exist due to the rural setting of the site. The average number of persons per household for Kitsap county is 2.65 people (USDC 1990). The nearest well is a City of Poulsbo standby municipal well located approximately 0.3 miles southeast of the site (EPA 1996). Populations using groundwater for drinking water are summarized in Table 3-1.

Table 3-1

GROUNDWATER DRINKING WATER POPULATION WITHIN A 4-MILE RADIUS

Distance (Miles)	Well Identification	Well Population	Total Population per Distance Ring
0 - 1/4	NA	0	0
1/4 - 1/2	City of Poulsbo	686.25	686
1/2 - 1	Poulsbo Heights Poulsbo Heights	43 43	86
1 - 2	Private Well City of Poulsbo (2) Back Forty Water System (2) Pioneer Acres Viewside Community Water Vinland View (2)	2.65 1,372.5 42 30 108 56	1,611
2 - 3	City of Poulsbo (1) Bela Vista Gala Pines Water Pioneer Hill West Scandialand Mobile Home Park Sherman Hill	686.25 283 180 45 81 15	1,290
3 - 4	Edgewater Estates (3) Naval Sub Base Bangor (5) Indian Hills Estates Lincoln Hills Estates Lofall Water Rhododendron Mobile Home Park	1,186 13,000 110 31 42 56	14,425
Total			18,098

Source: EPA 1996

3.2 SURFACE WASTE MIGRATION PATHWAY

The site is situated on a plateau on the western flank of the Big Valley River at an elevation of approximately 300 feet above mean sea level (ERM 1992; USGS 1981). According to borehole logs, the upper 1.5 to 5 feet of surface soils consist of loose to dense silty sand (Harza 1994). The land surface at the site slopes south and southeast. The drainage ditch flanking the northern side of the missile perimeter road drains to a small wetland/pond. Liberty Bay, an inlet of Puget Sound, and the mouth of the Big Valley River are both located approximately one mile southeast of the site. An overland route from the site to this surface water body was not identified in the field.

The 2-year, 24-hour rainfall event for the area of the site is 2.5 inches (NOAA 1973). The upgradient drainage area of the site is estimated from a topographic map to be approximately 300 to 500 acres (USGS 1981).

Because Liberty Bay and the Puget Sound are salt water bodies, no domestic or irrigation surface water intakes are located within 15 miles downstream of the site. Approximately 36,699 salmon and 24,951 bottomfish were caught for sport in 1993 from within 15 miles downstream of the site (WDF&W 1993b). It is estimated that each salmon weighed 7 pounds and that each bottomfish weighed 3 pounds. Approximately 1,925,000 pounds of Chinook, 11,964,000 pounds of Chum, 13,461,000 pounds of Pink, 4,767,000 pounds of Coho, and 10,428,000 pounds of Sockeye salmon per year are caught commercially from the Puget Sound (based on a five average ending in 1993) (WDF&W 1993a). Further, approximately 6,207,000 pounds of other anadromous fish and salmon eggs were harvested commercially from the Puget Sound annually for this period (WDF&W 1993a). It is estimated that 5% of fish and salmon eggs harvested commercially from the Puget Sound are caught within 15 miles downstream of the site. Catch figures for species caught within 15 miles downstream of the site are provided in Table 3-2.

Table 3-2

CATCH FIGURES WITHIN 15 MILES DOWNSTREAM OF THE SITE

Fishing Type	Type of Catch	Number of Fish	Fish Weight in Pounds	Total Pounds
Sport	Salmon	36,699	7	256,893
	Bottomfish	24,951	3	74,853
Commercial	Chinook			96,250
	Chum			598,200
	Pink			673,050
	Coho			238,350
	Sockeye			521,400
	Other Anadromous Fish and Salmon Eggs			310,350
Total				2,769,346

Sources: WDF&W 1993a; WDF&W 1993b

It is estimated from Wildlife Information Public Data Release maps that approximately 60 miles of wetlands exist within 15 miles downstream of the site (WDF&W 1996).

3.3 SOIL EXPOSURE PATHWAY

Approximately 999 people reside within a 1 mile radius of the site. The closest home is located approximately 300 feet to the south. The site is fully fenced and gated with one main entrance located on the south side and two secondary entrances: one north of the missile silos and one east of the barracks. The gate

for the entrance north of the silos has been removed. The remaining two gates are locked. No terrestrial sensitive environments are known to occur at the site (WDF&W 1996). Table 3-3 provides population figures for people residing within 1 mile of the site.

Table 3-3

POPULATIONS WITHIN A 1-MILE RADIUS

Distance Ring	Population
0 - 1/4 mile	50
1/4 - 1/2 mile	151
1/2 - 1 mile	798
Total	999

Source: EPA 1996

3.4 AIR MIGRATION PATHWAY

There is no one currently living or working at the Former Nike Missile Launch site #81. A total of 12,957 people live within a 4-mile radius of the site (EPA 1996). The closest occupied home is located approximately 300 feet to the south. The Bald Eagle (*haliaeetus laucocophalus*), a Federally-and State-listed threatened species, is known to reside between 1/4 and 1/2 mile from the site (WDF&W 1996). Approximately 1,160.1 acres of wetlands are located within 4 miles of the site (EPA 1996). Table 3-4 provides populations and wetland acreage by distance ring within 4 miles of the site.

Table 3-4

POPULATIONS AND WETLAND ACREAGE WITHIN A 4-MILE RADIUS

Distance (Miles)	Residents	Wetland Acreage
On a source	0	0
0 - 1/4	50	6.0
1/4 - 1/2	151	15.6
1/2 - 1	798	34.8
1 - 2	3950	312.9
2 - 3	4298	344.5
3 - 4	3710	446.4
Total	12.957	1,160.2

Source: EPA 1996

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ATTACHMENT A

PHOTOGRAPHIC DOCUMENTATION

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial #: 645492 **TDD #: 96-07-0013**
Lens Type: 35mm **Site Name: Nike Missile Launch Site #81**

Photo No.	Date	Time	By	Description
1	10/8/96	0925	MM	Looking north from the access road entrance towards the former barracks parking area (barracks on right).
2	10/8/96	0932	MM	View of the former missile assembly building (similar garage door on other side).
3	10/8/96	0939	MM	55-gallon drums located inside the former missile assembly building (labeled lead paint on top).
4	10/8/96	0944	MM	Debris located inside the former missile assembly building (unknown if drains exist below debris).
5	10/8/96	0949	MM	Wood debris located south of the former missile assembly building.
6	10/8/96	0954	MM	View of debris in the maintenance building located southwest of the assembly building (petroleum-stained concrete floors were noted).
7	10/8/96	1010	MM	View of an unidentified concrete mound located in the acid fueling area (note the water showering pole located behind the mound).
8	10/8/96	1018	MM	Looking north towards the three missile silo areas located below ground.
9	10/8/96	1025	MM	Looking west towards the south end of the silo area (note access road continuing on to the generator building).
10	10/8/96	1030	MM	View of one of the silo elevators that are all now inoperable.
11	10/8/96	1035	MM	Looking north towards middle (or second) silo area that is slightly elevated from the first silo.
12	10/8/96	1037	MM	View of concrete debris containing electrical conduit that is piled in the silo area (note another apparent shower in background).
13	10/8/96	1040	MM	View of north silo area and more concrete/piping debris dug up in the area.
14	10/8/96	1045	MM	View of north silo elevator shaft.
15	10/8/96	1052	MM	Looking south along the west side of the silo area towards a large amount of concrete/piping debris that is dug up in the area.
16	10/8/96	1100	MM	Looking south from access road towards the former generator building where 2 USTs were removed from the west (right) side of building (former transformer area is also located out of the picture on the left side of photo).

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial #: 645492 **TDD #: 96-07-0013**
Lens Type: 35mm **Site Name: Nike Missile Launch Site #81**

Photo No.	Date	Time	By	Description
17	10/8/96	1111	MM	View of existing (empty) petroleum AST located in the northwest corner of the former generator building (vent pipe is located on the other side of the wall at the corner of the building).
18	10/8/96	1118	MM	Looking south from main access road near entrance towards the former barracks (UST also removed from side of this building).
19	10/8/96	1124	MM	View of water well (yellow, center) located inside the former pump house (the well was reportedly abandoned in 1989).
20	10/8/96	1130	MM	Looking west towards the current property fenceline near the barracks where a drainfield was reported to have existed).

MM = Mike Martin

ATTACHMENT B

REFERENCES
(Included in original report only)